Chapter 2 — Alternatives

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BPA studied ways to relieve constraints on the transmission system in central Washington. Four construction alternatives were developed, all of which involve constructing a new transmission line. The alternatives are divided into segments for ease in analysis and are shown on Map 2, *Alternatives*. Segment A is common to all construction alternatives. Segment B has two route options (B_{NORTH} and B_{SOUTH}), which begin and end at the same points. The remaining segments are C, D, E, and F.

For Your Information

Construction alternatives include the Preferred Alternative and Alternatives 1, 3, and 1a. Alternatives are made up of Segments A through F.

This chapter describes the segments and alternatives, summarizes how environmental consequences would differ among them, and compares the alternatives against the purposes of the project. BPA has identified a preferred alternative that best meets the purpose and need for the project.

This chapter also describes other alternatives (e.g., burying transmission lines) that were briefly studied and eliminated from detailed consideration for technical or economic reasons.

2.1 Segments

The following is a description of Segments A through F. (See Map 2, *Alternatives*.)

2.1.1 Segment A

Common to all alternatives, Segment A starts at BPA's Schultz Substation and goes southeast, following the existing Vantage–Schultz 500-kV transmission line. BPA plans to redesign the existing lines that currently exit the Schultz Substation to the east, to make room for the new line and improve the configuration of the existing lines. This redesign is referred to as the Sickler-Schultz Reroute. Figure 2.1, *Sickler-Schultz Reroute,* shows the Schultz Substation area. BPA

For Your Information

*A **bay** is an area set aside in a substation for special equipment.*

would relocate the first mile of the existing Sickler-Schultz 500-kV transmission line from its current location, to a new ***bay*** on the north side of the substation.

The decision of whether to use Option 1 or 2 of the Sickler-Schultz Reroute would depend on negotiations with the landowners.

From the substation, the Sickler-Schultz Reroute would head northeast along one of two optional routes for approximately 1 mile to intersect with the existing Rocky Reach–Maple Valley 345-kV line. (See Figure 2.1, *Sickler-Schultz Reroute.*) The two options are approximately 1,200 feet apart on the south side and converge to the same tower on the north. The second option was developed in response to landowner concerns. It would require one more tower. From the tower where the two options converge, the line would follow the Rocky Reach–Maple Valley line for approximately 1.5 miles to the northeast. At this point, the relocated Sickler-Schultz line would reconnect with the existing Sickler-Schultz line and continue to the northeast.

Since the DEIS, BPA determined that the existing structures on the Schultz-Vantage line between the substation and Naneum Crossing would not be able to support the new conductor and would have to be replaced.

The existing Schultz-Vantage 500-kV line from Schultz Substation to the Naneum Crossing would be rebuilt. (See Figure 2.1, *Sickler-Schultz Reroute.*) The line would then be connected with the new transmission line running parallel to the existing Schultz-Vantage line to the southeast. The existing Schultz-Vantage line would be connected to the vacated portion of the Sickler-Schultz line running into the Schultz Substation. The portion of the Sickler-Schultz line that runs due north from the Naneum crossing would be removed because it would no longer be needed. This combination of rerouting and reconnecting lines would eliminate the existing 500-kV line from crossings.

Southeast of Naneum crossing the new transmission line would be constructed roughly parallel to the existing Schultz-Vantage line. The new line would be located on the north side of the existing line starting with a 200-foot separation for approximately 6 miles and then a 400-foot separation for approximately 4 miles. The remaining 13 miles would have a variable separation ranging from 500 feet to 1,375 feet. Segment A would cross the Vantage Highway. Segment A is 27.5 miles long, including 2.25 miles of relocated Sickler-Schultz line and 2 miles of rebuilt line between Schultz Substation and the Naneum crossing.

2.1.1.1 Segment A Reroute

There is a potential reroute within Segment A, referred to on Map 2, *Alternatives,* and shown in detail on Map 3, *Segment A Reroute*. This reroute was introduced when BPA identified potential difficulty in acquiring the rights to build the new line parallel to the existing Schultz-Vantage line across a large parcel northwest of Colockum

Road. This parcel of land is under Tribal Allotment status, with Native American landowners. The Segment A Reroute would be located around the land parcel in question. BPA's right to keep the existing Schultz-Vantage line on the property was also in question; therefore, the Segment A Reroute includes the relocation of the existing line.

As shown on Map 3, *Segment A Reroute,* the existing Schultz-Vantage line and the new transmission line would be rerouted in a southeasterly direction approximately 1/2 mile southeast of Coleman Road. Approximately 200 feet would separate the two lines. At the crossing of Cooke Canyon Road, the lines would be directed east. The rerouted lines would then intersect with the original alignment just west of Colockum Road and the new line would remain on the north. The Segment A Reroute would be approximately 1 1/4 miles long.

If the Segment A Reroute were to be chosen, a little more than a mile of the existing Schultz-Vantage line would be removed. Please see Appendix B, *Description and Comparison of Impacts Along Segment A Reroute,* for greater detail of the Segment A Reroute.

BPA's preference is to keep the existing line where it is and to build the new line along Segment A.

2.1.2 Segment B

Segment B begins where the new transmission line would cross to the south side of the existing Schultz-Vantage line, approximately 5 miles south of where the Schultz-Vantage transmission line crosses I-90. (See Map 2, *Alternatives*.)

Segment B has two route options, B_{NORTH} and B_{SOUTH}. The original route is B_{NORTH}, which would follow the existing line at the planned separation of 1,200 feet. The YTC, which controls the land crossed by Segment B, has safety concerns regarding aerial training occurring in the same area as two 500-kV transmission lines spaced rather far apart. Representatives from the YTC requested another route where the new line would parallel other transmission lines farther to the south than the Schultz-Vantage line. These other transmission lines are less than 500-kV, thus enabling BPA to group the lines closer together and reduce the aerial training concerns.

B_{NORTH} runs to the east, parallel to and 1,200 feet south of the Schultz-Vantage line. This route option follows the existing line across the Columbia River and ends at the BPA Vantage Substation. B_{NORTH} is 9.1 miles long.

B_{SOUTH} would initially run to the southeast, then cross two other transmission lines and turn almost due east. The new line would parallel an existing 230-kV wood pole transmission line on the south side of the John Wayne Trail for approximately 5 miles. Just before the Columbia River, B_{SOUTH} would angle slightly to the north towards the Schultz-Vantage line. The two lines would parallel one another with a 300-foot separation and would cross the Columbia River. B_{SOUTH} ends at the south end of the BPA Vantage Substation and is approximately 9.5 miles long.

2.1.3 Segment C

Segment C starts in the same place as Segment B (where the new line would cross the existing Schultz-Vantage line). The segment would turn south, crossing the YTC. This segment would not parallel an existing line. The segment would angle southeast, leave the YTC, cross Highway 24, and end where it intersects the existing Hanford-Ostrander and Hanford-John Day 500-kV transmission lines. This intersection of lines would be the site of a new substation, called Wautoma Substation. Segment C is 30.1 miles long.

2.1.4 Segment D

Segment D begins in the area just south of Vantage Substation (See Map 2, *Alternatives*). The new line would not enter the substation. Segment D would head in a southeasterly direction, running parallel approximately 125 feet to the west of the existing Midway-Vantage 230-kV line. This separation would continue for approximately 4 miles and cross Crab Creek.

While climbing the Saddle Mountains, the separation between the new and existing lines would increase, with the widest point (approximately 400 feet wide) at the top of the mountain. The separation would slowly decrease on the south side of the Saddle Mountains and the lines would be immediately adjacent to one another approximately 9 miles south of Vantage Substation.

➡ For Your Information

***Double-circuit** structures hold conductors for two transmission lines.*

BPA structures are numbered. The first number is the transmission line mile and the second number is the structure in that mile.

Northeast of Mattawa, the Midway-Vantage line structures would be removed and replaced with ***double-circuit*** structures carrying the new line and the Midway-Vantage 230-kV line through irrigated areas. This double-circuit section would be about 8 miles long from existing structure 11/1 to 2/4. The conductors on the east side of the double-circuit structures would operate at 230-kV (existing Midway-Vantage line), and the west side would operate at 500-kV (new line). The ROW on the east side would extend 50 feet from centerline and on the west side it would extend 75 feet from centerline. Beyond the irrigated areas, just north of the Columbia River, Segment D would again parallel the Midway-Vantage line on the west side and cross the

Columbia River. Segment D would pass the BPA Midway Substation on the west side and continue south up the Umtanum Ridge. The new line would parallel the existing Midway-Big Eddy 230-kV line 125 feet to the west. South of State Route 24, the new line would cross to the east side of the Midway-Big Eddy where it crosses two other lines. The new line would angle away from the existing lines as it climbs and descends the Yakima Ridge, terminating in the new Wautoma Substation. Segment D is 26.7 miles long.

2.1.5 Segment E

Segment E begins at Vantage Substation and heads south, paralleling the existing Vantage-Hanford 500-kV line 1,200 feet to the north. It would cross Crab Creek, climb the Saddle Mountains, and head southeast, crossing the Saddle Mountain Unit of the Hanford Reach National Monument. After crossing the Columbia River, Segment E would end at the existing BPA Hanford Substation. Segment E is 25.3 miles long.

2.1.6 Segment F

Segment F begins at Vantage Substation and heads east, then south crossing Crab Creek and climbing the Saddle Mountains. It would then follow the Vantage-Hanford line for a short length before turning due east. Segment F would traverse about 14 miles along the south slope of the Saddle Mountains, and then intersect the Grand Coulee-Hanford 500-kV transmission line. It would then turn south and parallel the existing Grand Coulee-Hanford line 1,200 feet to the east across the Wahluke Slope. After crossing the Columbia River, the segment ends at the Hanford Substation. Segment F is 32.8 miles long.

2.2 Agency Preferred Alternative (Alternative 2)

BPA is proposing to construct a new 500-kV transmission line between the Schultz Substation, almost 9 miles north of Ellensburg, Washington, and a new substation (Wautoma Substation) in Benton County, 2 miles south of Highway 24 (T12N, R24E, Sec. 20). The Preferred Alternative is Alternative 2, made up of Segments A (including Option 1 of the Sickler-Schultz Reroute), $B_{SOUTH,}$ and D (see Map 2, *Alternatives*), and is 63.7 miles long. It does not include the Segment A Reroute. The Preferred Alternative would cost approximately $107,000,000 (2002 dollars).

➡ For Your Information

BPA completed a detailed cost estimate for the Preferred Alternative. The new cost is approximately 40% greater than the cost stated in the DEIS. Detailed cost estimates were not completed for the other alternatives. To be able to compare costs of alternatives, the estimated costs from the DEIS were increased by 40%.

For Your Information

*A transmission line designed to hold one electrical circuit is called **single-circuit.***

2.2.1 Transmission Line

2.2.1.1 Structures

The Preferred Alternative would primarily use 500-kV, ***single-circuit*** steel lattice structures, also called towers, to support the transmission line conductors. More than half of the structures would be delta configuration. (See Figure 2.2, *Proposed Structures.*) Flat configuration structures would be used in three selected areas. The first area would be approximately 16.2 miles, from approximately 1 mile north of Interstate 90 (I-90) in Segment A, south through the YTC and across the Columbia River in B_{SOUTH}. The next section would be in Segment D starting just north of Crab Creek going south up and over the Saddle Mountains across BLM land for 4.4 miles. The last section of flat configuration would start after the agricultural area just north of the Columbia River. Flat configuration would be used over the Columbia River, past Midway Substation and up Umtanum Ridge. The length of this last section would be approximately 3.2 miles, most of the Hanford Monument crossing.

Through the agricultural area in Segment D, 500-kV double-circuit lattice structures would be used to hold the new 500-kV and the existing 230-kV line.

A thorough description of how structures are constructed is in Appendix C, Construction Procedures

The height of each structure would vary by location and surrounding land forms. Single-circuit delta structures would average 135 feet high. Flat configuration structures would average 90 feet high. The double-circuit structures would average 170 feet high.

2.2.1.2 Conductors

***Alternating current** is an electrical current that reverses directions at regular intervals.*

The wires or lines that carry the electrical current in a transmission line are called conductors. ***Alternating current*** transmission lines, like the new line, require three sets of wires to make up a circuit. For a single-circuit 500-kV transmission line, there would be three sets of wires and for a double-circuit line (Segment D), there would be six sets of wires.

More information on how conductors are attached to structures is in Appendix C, Construction Procedures.

Conductors are not covered with insulating material, but rather use the air for insulation. Conductors are attached to the structure using porcelain or fiberglass insulators. Insulators prevent the electricity in the conductors from moving to other conductors, the structure, and the ground.

Two smaller wires, called overhead ground wires, are attached to the top of transmission structures. Overhead ground wires protect the transmission line from lightning damage. To disseminate the electrical

power from lightning, the power is routed to the ground at each tower through wires called counterpoise.

2.2.2 Right-of-Way

New ROW would be needed for the new structures and line. The new ROW would be 150 feet wide for the delta configuration structures and 180 feet wide for flat configuration (See Figure 2.2, *Proposed Structures.)* The wider ROW for the flat configuration provides adequate electrical clearance for the conductors. Where the new line would parallel an existing 500-kV line (Segment A), the centerline of the new line would be from 200 to 1,375 feet from the existing line. See Appendix D, *Line Separation Issue Paper*, for an explanation of the separation distance. The land between the two transmission lines may (depending on landowner preference) be included in the easement BPA would acquire from the landowner. The distance from the new line centerline to the nearest edge of ROW would depend on the type of structure, 75 feet for delta and 90 feet for flat (to provide adequate electrical clearances).

For Your Information

A thorough description of ROW acquisition and preparation is in Appendix C, Construction Procedures and Appendix E, Property Impacts.

From I-90 south in the YTC, the new line would be located in a 180-foot-wide ROW until it joins a 115-kV line along the John Wayne Trail. In this portion of the line, the ROW would be 150 feet wide directly adjacent to the ROW of the other line. Once these two lines diverge, the new line would join the Schultz-Vantage line at a 300-foot separation and cross the Columbia River. The distance from the centerline of the new line to the outside of the ROW would be 100 feet.

In Segment D, where the existing line would be replaced with a double-circuit line, the existing ROW would be expanded 25 feet on the west side, increasing the ROW from the existing 100 feet to 125 feet. Where the new line is parallel to the 230-kV line using a delta configuration, the new ROW would be 150 feet wide. Where flat configuration would be used, the new ROW would be 180 feet wide.

BPA would obtain easements from landowners for new ROW. These easements give BPA the right to construct, operate, and maintain the line. Fee title to the land covered by the easement generally remains with the owner, and is subject to the provisions of the easement. For more information on easement acquisition, see Appendix E, *Property Impacts*.

The easement prohibits large structures, tall trees, storing flammable materials, and other activities that could be hazardous to people or endanger the transmission line. Activities that do not interfere with the transmission line or endanger people are usually not restricted.

2.2.3 Clearing

Vegetation within the ROW is restricted by height. This is required for the safe and uninterrupted operation of the line. Table 2.2-1, *Preferred Alternative: Tree Removal*, lists the number and location of trees in the ROW that would be cleared for the Preferred Alternative. In addition, there are a few trees outside of the ROW near Cooke Creek that would potentially need to be cut. These trees are tall enough to cause an outage if they were to fall. Tree specialists would examine the trees. If the trees are stable, they could remain standing, but if they are dying or diseased, they would be cut. Trees that would not typically grow taller than BPA safety limits would not be cleared from the ROW.

Table 2.2-1
Preferred Alternative: Tree Removal

Creek	Number of Trees to be Removed (approximate)
Wilson Creek	4 (Sickler-Schultz Reroute, Option 1)
Wilson Creek	0 (Sickler-Schultz Reroute, Option 2)
Naneum Creek	2 (Sickler-Schultz Reroute, Options 1 & 2)
Schnebly Creek	5
Coleman Creek	2
Cooke Creek	30

Table is new for the FEIS.

➡ For Your Information

Clearing limits and description are given in Appendix C, Construction Procedures.

At the structure sites, all trees and brush would be cut and removed within a 100-by-150-foot area, with root systems being removed from a 50-by-50-foot area for the tower footings. A portion of the site would be graded to provide a relatively level work surface for the erection crane.

Woody debris and other vegetation would either be left lopped and scattered, piled, or chipped, or would be taken off-site. Burning would not be used.

The footprint of the structures would be considered permanent disturbance for vegetation. The average footprints are 25 by 25 feet for flat configuration, 27 by 27 feet for delta configuration, and 32 by 32 feet for the double-circuit structures. The total permanent disturbance from 298 structures in the Preferred Alternative would be 5.8 acres. Temporary disturbance from equipment movement around the structures would be 119.2 acres. If Option 2 of the Sickler-Schultz Reroute is selected, the structure count would increase by 1, permanent disturbance would increase by 0.05 acre and temporary disturbance would increase by 0.8 acre.

2.2.4 Access Roads

Access roads on and off the ROW would be used to construct and maintain a new line. A combination of new and existing roads, and upgraded existing roads would be used to access the new line. Existing access roads would be used whenever possible, with ***spur roads*** constructed to the new structures.

For Your Information

Spur roads *are short road segments branching off the trunk roads that go to each structure if the structure is not located on a trunk road.*

New roads would be located within the ROW wherever possible. Where conditions require, such as at steep cliffs, roads would be constructed and used outside the ROW. BPA normally acquires easements for the right to develop and maintain permanent over-ground access for wheeled vehicle travel to each structure. No permanent access road construction would be allowed in cultivated or fallow fields unless previously agreed to by the landowner. After construction of the line is completed, BPA would allow any roads in cropland to be returned to crop production.

Construction of access roads is thoroughly described in Appendix C, Construction Procedures.

Where existing access roads would be used, BPA would improve them to a level that supports construction travel needs. This would be done by grading, improving drainage, and adding gravel to the road surface.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of the Preferred Alternative.

New access road surfaces would be 14 feet wide with a 3-foot temporary disturbance area on either side of the road. The total disturbance width would be 20 feet. New roadbeds would be rocked.

Existing access roads along the Preferred Alternative have been surveyed and classified into four categories. Some existing access roads would not need to be improved. The other three categories vary on the extent of work needed to upgrade the roads to 14-foot roadbeds. The work breakdown of the three categories are:

- road base improvements, bladed and rocked (i.e. currently unusable with large ruts or unstable road)
- bladed and rocked
- rock only

The existing roads that would only require additional rock are located on the Hanford Monument near Midway Substation.

In the areas where helicopter tower construction would occur, road widths would be reduced to 12 feet wide. For the sake of this EIS the greater, or worst case, of 14 feet is used for disturbance estimates.

Table 2.2-2
Preferred Alternative: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	Total New Construction (mi)	Total of Improved Roads (mi)
A	27.5	10.9	23.0
BSOUTH	9.5	3.3	14.0
D	26.7	3.8	19.3
TOTAL	**63.7**	**18.0**	**56.3**

Table has been updated for the FEIS.

For Your Information

Waterbars *are smooth shallow ditches excavated at an angle across a road to decrease water velocity and divert the water off and away from the road surface.*

Dips, culverts, and ***waterbars*** would be installed within the roadbed to provide drainage. Temporary roads would be repaired and if the land use permits, the road would be reseeded with appropriate seed mixtures.

Fences, gates, cattle guards, and additional rock would be added to access roads where necessary.

Table 2.2-3
Preferred Alternative: Estimate of Access Road Disturbance (Area)

Segment	Permanent Disturbance (Ac)	Temporary Disturbance (Ac)	Total Road Work Disturbance (Ac)
A	18.50	24.65	43.15
BSOUTH	5.65	12.60	18.25
D	6.40	16.75	23.15
TOTAL	**30.55**	**54.00**	**84.55**

Table has been updated for the FEIS.

2.2.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be 1/4 acre in size and located every 3.5 miles along the transmission line. The Preferred Alternative would require an estimated 4.25 acres to be cleared for the pulling and reeling areas along the route. Most of the pulling and reeling sites would be located within the ROW. Some would extend beyond the ROW at angles in the line.

2.2.6 Staging Areas

During construction of the transmission line, areas would be needed off the main highways, near the ROW, where equipment such as steel, spools of conductor, and other construction materials would be stored until material is needed. Where helicopters would be used to build the transmission line, staging areas would be used to pre-assemble the towers for helicopter delivery to tower sites. These sites would be close to the line and spaced about 8 to 10 miles apart.

Staging area locations would be determined by the construction contractor just before or during construction. The size of each site would vary. The construction contractor would negotiate with the landowner for the use of staging sites. An environmental review would be done before the use of a staging site is approved.

At this time, staging area locations are not known.

2.2.7 Substations

For the Preferred Alternative, a new transmission line would begin at Schultz Substation and terminate at a new substation, called Wautoma Substation. Additions and modifications would occur at Schultz Substation. No work would be needed at the Vantage or Midway Substations.

Schultz Substation – A new bay would be constructed within the existing fenced yard of the substation. The following equipment would be installed in the Schultz Substation.

Power circuit breakers – A breaker is a switching device that can automatically interrupt power flow on a transmission line at the time of a fault, such as a lightning strike. The breakers would be installed in the substations at either end of the line. The breakers would be SF6 gas breakers, which are insulated by special non-conducting gas (sulfur hexafluoride). The breakers would not contain oil, except for a small amount of hydraulic fluid used to open and close the electrical contacts.

Motor-operated disconnect switches – These devices are used to mechanically disconnect or isolate equipment. Switches are normally located on both sides of circuit breakers.

Buswork – Power moves within the substation on rigid aluminum pipes called bus tubing. The tubing is supported and vertically elevated by pedestals called bus pedestals. Buswork is a generic term to describe all equipment associated with the bus tubing.

Potential transformers (PTs) – A type of transformer that uses low-voltage to monitor the high-voltage system. The low-voltage output of this transformer is used for relaying and metering.

Substation dead-end towers – Towers within the confine of the substation where incoming and outgoing transmission lines end. Dead-ends are typically the tallest structures in a substation.

Wautoma Substation – A new substation would be constructed in Benton County, 2 miles south of Highway 24 (T12N, R24E, Section 20). The new substation would be sited at the intersection of the new transmission line and the Hanford-Ostrander 500-kV and Hanford-John Day 500-kV transmission lines. These two lines would be looped through the new substation. A parcel of approximately 47 acres would be purchased for the new substation. Land for the new substation would be acquired in fee and would remain in BPA and federal government ownership.

The footprint of the substation would be approximately 820 feet by 530 feet. This area would include the substation yard (equipment within the fence) and grading outside of the fence. The actual fenced area would be about 780 feet by 490 feet. Benton Rural Electric Association would build a 12.5-kV distribution line from the existing distribution line coming out of Black Rock Substation to the Wautoma site. This line would supply the power for substation equipment such as switches, breakers, lights, and air conditioning. The distribution line would be on single wood poles and located within previously disturbed land.

➡ For Your Information

Construction of the substation is thoroughly described in Appendix C, Construction Procedures.

An access road would be built between SR 241 and the substation. From SR 241, the road would go due east for approximately 1/2 mile, then turn southeast for approximately 1/3 mile to the substation. The road would have an asphalt approach to SR 241 and the remaining road would be gravel. The travel surface would be 20 feet wide with 5-foot shoulders on each side equaling 30 feet. The road would be designed to accommodate large trucks and equipment used in the building and maintenance of the substation.

This substation would be built slightly different than the standard substation because existing lines cross the substation site and there are existing towers within the footprint of the substation. These lines would not be taken out of service during construction of the substation, so construction would occur under energized lines. Construction crews would first clear and grade the substation site to the extent possible. Conduits, drainage pipes, and the grounding system would be trenched or dug into the ground. Footings for the equipment and the foundation for the control house would then be placed in appropriate positions. Footings for new towers would be

installed where needed in line with the existing transmission lines, outside of the substation boundaries. During the work window when the existing lines can be de-energized, new towers would be built for the existing transmission lines and the conductors rerouted onto the new towers and through substation equipment. Existing towers within the footprint of the substation would be removed. The existing transmission lines would be re-energized and work on the substation would continue. A chain link fence around the substation would be installed. Approximately 6 inches of rock would be laid, which would extend outside of the fence. Equipment such as breakers, buswork, switches, a generator, and PTs would be installed in the yard and the control rack would be installed in the control house.

2.2.8 Communication Equipment

BPA substations are electronically connected to BPA's transmission system control centers. Microwave communication sites and fiber optic communication lines connect BPA's high-voltage substations to system control centers located in Vancouver and Spokane, Washington. Dispatchers within the control centers remotely monitor meters and gauges on electric power equipment within each substation and receive alarm signals when emergency conditions occur. Dispatchers have the ability to disconnect lines and electrical equipment when transmission failures occur.

For Your Information

Fiber optic line installation is thoroughly described in Appendix C, Construction Procedures.

As part of the Preferred Alternative, BPA would install fiber optic cable between Vantage Substation and the new Wautoma Substation (approximately 27 miles) and from Vantage Substation north to the BPA Columbia Substation (approximately 32 miles). The new fiber would enable remote operation of the new substation as well as reinforce BPA's communication network.

From Vantage to Columbia Substation, fiber would be strung on existing transmission line structures. No new ROW would be needed and existing roads would be used for fiber installation. From Vantage to the new Wautoma Substation, the fiber would be strung on a combination of the new double-circuit transmission structures and existing lines. A combination of existing roads and new roads that would be built for the new transmission line would be used for fiber installation. From the new Wautoma Substation, fiber would also be installed on existing structures to loop back to the Midway Substation. Existing access roads would be used for fiber installation and no road improvements are expected.

The fiber cable would be less than 1 inch in diameter and would be mounted under the conductors. Every 3 to 5 miles there would be a splice box/reeling location for the stringing and tensioning of the fiber optic line. The splice box would be located on a transmission tower

and an area approximately 1/4 acre in size in line with the conductors would be temporarily disturbed by a reeling truck and tensioning equipment. Five acres of temporary disturbance for the Preferred Alternative would be associated with the fiber line.

2.2.9 Maintenance

For Your Information

The BPA Transmission System Vegetation Management Program EIS was completed in August 2000, and describes the planning steps, agencies, and landowners to be coordinated with, and the tools to be used to control vegetation along BPA facilities. This document is available for review on the web at http://www.efw.bpa.gov/cgi-bin/PSA/NEPA/SUMMARIES/VegetationManagement_EIS0285.

BPA would perform routine, periodic maintenance and emergency repairs on structures, substations, and accessory equipment. These activities typically include replacing insulators, inspections of structures, and vegetation control. Within the substations, BPA may need to periodically replace equipment.

Existing and new permanent access roads to structures would remain throughout the life of the line so that BPA can perform routine and emergency maintenance on the transmission line. Road maintenance could include grading and clearing, and repairing ditches and culverts.

A large part of maintenance activities is vegetation control. In Central Washington, this primarily focuses on the spread of noxious weeds. Tall growing vegetation would also need to be managed in and adjacent to the ROW, primarily where the line crosses water bodies. Vegetation maintenance activities would follow the guidelines set in the BPA Transmission System Vegetation Management Program EIS. When vegetation control is needed, a vegetation management checklist would be developed for the ROW. It would identify sensitive resources and the methods to be used to manage vegetation. Substations are periodically sprayed with herbicide to keep plants from growing and creating a safety hazard.

2.3 Alternative 1

Reminder

Detailed cost estimates were not completed for the other alternatives. To be able to compare costs of alternatives, the estimated costs from the DEIS were increased by 40%.

Alternative 1 would start at the Schultz Substation and follow Segments A and B_{SOUTH}. As with the Preferred Alternative, Alternative 1 would not include the Segment A Reroute. The line would enter the Vantage Substation in order to pass to the east side of existing lines. It would then follow the existing Vantage-Hanford 500-kV line 1,200 feet to the north along Segment E, and would be 62.3 miles long. The new line would end at the existing Hanford Substation. The outside limits of the Hanford Substation would not need to be expanded for this alternative. This alternative has an estimated cost of $124,000,000.

2.3.1 Transmission Line

2.3.1.1 Structures

Alternative 1 would use 500-kV delta and flat configuration single-circuit steel lattice structures. (See Figure 2.2, *Proposed Structures*.) The height of each structure would vary by location and surrounding land forms; the delta configuration structures would have an average height of 135 feet, while the flat configuration structures would average 90 feet.

The structures used in Segments A and B_{SOUTH} would be the same as described in the Preferred Alternative. In Segment E, delta configuration structures would be used out of Vantage Substation, but just north of Crab Creek flat configuration structures would be used continuing south up and over the Saddle Mountains. The length would be approximately 9.5 miles and end at the agricultural fields. Another section of flat configuration would be approximately 6 miles across the Hanford Monument and into Hanford Substation.

2.3.1.2 Conductors

The single-circuit transmission line would be made up of three sets of wires. The insulators and overhead ground wires would be the same as discussed earlier for the Preferred Alternative.

2.3.2 Right-of-Way

The ROW would be 150 feet wide for the delta configuration structures and 180 feet wide for the flat configuration structures. The distances and ROW widths for Segments A and B_{SOUTH} would be the same as described in the Preferred Alternative. Along Segment E, similar to in Segment A, where the line separation would be 1,200 feet, BPA would acquire easement rights from the landowners for the land between the two lines, including the new ROW. See Appendix D, *Line Separation Issue Paper*, for an explanation of the separation distance.

Easement provisions would be the same as those discussed earlier for the Preferred Alternative.

2.3.3 Clearing

Clearing requirements would be the same as those discussed earlier for the Preferred Alternative. The structure footprints would be the same as described earlier for the single-circuit structures. The total permanent disturbance as a result of the 281 structures would be approximately 5.6 acres. Temporary disturbance from the equipment

movement around the structures would be approximately 114.3 acres. If Option 2 of the Sickler-Schultz Reroute is selected, the structure count would increase by 2, permanent disturbance would increase by 0.05 acre and temporary disturbance would increase by 0.8 acre.

2.3.4 Access Roads

A new access road system would be built for the majority of Alternative 1. Wherever possible, the access roads would be located on the ROW. BPA normally acquires easements for the right to develop and maintain permanent over-ground access for wheeled vehicle travel to each structure. No permanent access road construction would be allowed in cultivated or fallow fields. Any roads in cropland would be removed and the ground would be restored to the original contour when construction of the line is completed.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of Alternative 1. Assumptions were made based on terrain and line location.

New access roads surfaces would be 14 feet wide, with a 3-foot temporary disturbance area on either side. New and existing road beds would be gravel or rock. Existing roads would be upgraded to 14 feet wide where necessary.

Drainage, fences, and gates would be installed where needed as described earlier for the Preferred Alternative.

Table 2.3-1
Alternative 1: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total of Improved Roads (mi)
A	27.5	0.40	10.9	0.84	23.0
BSOUTH	9.5	0.35	3.3	1.47	14.0
E	25.3	0.33	8.4	2	50.6
TOTAL	**62.3**		**22.6**		**87.6**

Table has been updated for the FEIS.

Table 2.3-2
Alternative 1: Estimate of
Access Road Disturbance (Area)

Segment	Permanent Disturbance (Ac)	Temporary Disturbance (Ac)	Total Road Work Disturbance (Ac)
A	18.50	24.65	43.15
BSOUTH	5.65	12.60	18.25
E	14.25	42.90	57.15
TOTAL	**38.40**	**80.15**	**118.55**

Table has been updated for the FEIS.

2.3.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be 1/4 acre in size and located every 3.5 miles. Alternative 1 would require an estimated 4.5 acres to be cleared for the pulling and reeling areas along the route.

2.3.6 Staging Areas

Staging areas would be located and used similar to those described earlier for the Preferred Alternative.

2.3.7 Substations

For Alternative 1, a new transmission line would begin at the Schultz Substation and end at Hanford Substation. The line would pass through the Vantage Substation, but no electrical equipment would be installed within the Substation as part of this project.

Schultz Substation – The new equipment installed at Schultz Substation would be the same as described earlier for the Preferred Alternative.

Hanford Substation – A new bay would be constructed within the existing fenced yard of the substation. Outside of the substation fence, one or two of the existing transmission line structures may need to be relocated in order to align with the readjusted substation equipment. The new equipment within the substation would include breakers, switches, buswork, and PT's.

Vantage Substation – The line would pass through the Vantage Substation in order to get from the west to east side of existing lines. A new bay and dead end would be constructed within the existing

fenced yard of the substation. Some existing transmission line towers may need to be moved to make room for the new line.

2.3.8 Communication Equipment

As part of Alternative 1, BPA would install fiber optic cable between Vantage Substation and Midway Substation (about 19.3 miles) and from Vantage Substation north to the BPA Columbia Substation (about 32 miles). The new fiber would reinforce BPA's communication network and make the fiber optic system more reliable.

The fiber optic cable would be strung on existing transmission line structures. The fiber cable would be less than 1 inch in diameter. As described in the Preferred Alternative, every 3 to 5 miles there would be a splice box/reeling location for the stringing and tensioning of the fiber optic line. These sites would result in 1/4 acre of temporary disturbance each or approximately 4.25 acres for the new fiber to be installed as part of Alternative 1.

2.3.9 Maintenance

Maintenance activities would be similar to those described earlier for the Preferred Alternative.

2.4 Alternative 3

Alternative 3 would start at the Schultz Substation and follow Segment A. It would not include the Segment A Reroute. It would then turn south and follow Segment C through the YTC. South of the YTC in Benton County, the line would terminate at the new Wautoma Substation as described earlier for the Preferred Alternative and would be 57.6 miles long. This alternative has an estimated cost of $94,000,000. No land costs were added to the estimate for the purchase of easements across the YTC. Due to the large impact to the Army, BPA would possibly need to compensate the Army for the loss of the use of land used for maneuvers, thereby potentially increasing the cost of Alternative 3.

Reminder

Detailed cost estimates were not completed for the other alternatives. To be able to compare costs of alternatives, the estimated costs from the DEIS were increased by 40%.

2.4.1 Transmission Line

The structures used in Segment A would be the same as described in the Preferred Alternative. The structures within Segment C across the YTC would be flat configuration for approximately 24 miles. Outside of the YTC land, delta configuration structures would be used for approximately 6 miles.

2.4.2 Right-of-Way

The ROW would be 180 feet wide for the flat configuration structures and 150 feet wide for the delta configuration structures. The distances and ROW widths for Segment A would be the same as described in the Preferred Alternative. Along Segment C, the ROW width would reflect the width needed for the particular structures; this portion of the line would not be parallel to any existing lines.

Easement provisions would be the same as those discussed earlier for the Preferred Alternative.

2.4.3 Clearing

Clearing requirements would be the same as those discussed earlier for the Preferred Alternative. The structure footprints would be the same as described earlier for the single-circuit structures. The total permanent disturbance as a result of the 269 structures would be approximately 4.7 acres. Temporary disturbance from the equipment movement around the structures would be approximately 110 acres. If Option 2 of the Sickler-Schultz Reroute is selected, the structure count would increase by 2, permanent disturbance would increase by 0.05 acre and temporary disturbance would increase by 0.8 acre.

2.4.4 Access Roads

New access roads would be built for the majority of Alternative 3. Roads would be built as described earlier for the Preferred Alternative.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of Alternative 3. Assumptions were made based on terrain and line location.

Table 2.4-1
Alternative 3: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total of Improved Roads (mi)
A	27.5	0.4	10.9	0.84	23.0
C	30.1	2.8	84.3	2.5	75.3
TOTAL	**57.6**		**95.2**		**98.3**

Table has been updated for the FEIS.

Table 2.4-2
Alternative 3: Estimate of
Access Road Disturbance (Area)

Segment	Permanent Disturbance (Ac)	Temporary Disturbance (Ac)	Total Road Work Disturbance (Ac)
A	18.50	24.65	43.15
C	143.05	109.55	252.60
TOTAL	**161.55**	**134.20**	**295.75**

Table has been updated for the FEIS.

2.4.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be 1/4 acre in size and located every 3.5 miles. Alternative 3 would require an estimated 4.75 acres to be cleared for the pulling and reeling areas along the route.

2.4.6 Staging Areas

Staging areas would be located and used similar to those described earlier for the Preferred Alternative.

2.4.7 Substations

For Alternative 3, a new transmission line would begin at the Schultz Substation and end at the new Wautoma Substation.

Schultz Substation – The new equipment installed at Schultz Substation would be the same as described earlier for the Preferred Alternative.

Wautoma Substation – The construction of the substation would be the same as described earlier for the Preferred Alternative.

2.4.8 Communication Equipment

Alternative 3 would include the installation of fiber optic cable between Vantage Substation north to Columbia Substation as well as south to the new Wautoma Substation as described in the Preferred Alternative. Between Vantage and the new Wautoma Substations, the fiber would be added to existing lines. The number of reeling and tensioning sites and the amount of disturbance caused by those would be approximately the same as that of the Preferred Alternative.

2.4.9 Maintenance

Maintenance activities would be similar to those described earlier for the Preferred Alternative.

2.5 Alternative 1A

Reminder

Detailed cost estimates were not completed for the other alternatives. To be able to compare costs of alternatives, the estimated costs from the DEIS were increased by 40%.

Alternative 1A would start at the Schultz Substation and follow Segments A and B_{SOUTH}. As with the Preferred Alternative, Alternative 1A would not include the Segment A Reroute. The new line would enter the Vantage Substation and cross to the east side of the existing transmission lines. The line would then follow Segment F into Hanford Substation. The line would be approximately 69.8 miles long. The outside limits of the Hanford Substation would not need to be expanded for this alternative. This alternative has an estimated cost of $94,000,000.

2.5.1 Transmission Line

2.5.1.1 Structures

In Segment F, delta configuration structures would be used out of Vantage Substation, but just north of Crab Creek flat configuration structures would be used continuing south up the Saddle Mountains. Due to wildlife concerns, flat configuration would be used along the Saddle Mountains, through the Hanford Monument, and into Hanford Substation.

2.5.1.2 Conductors

The conductors and overhead groundwire would be the same as discussed earlier for the Preferred Alternative.

2.5.2 Right-of-Way

The ROW would be 150 feet wide for the delta configuration structures and 180 feet wide for the flat configuration structures. The distances and ROW widths for Segments A and B_{SOUTH} would be the same as described in the Preferred Alternative. Along Segment F, the ROW width would be 180 feet wide for the flat configuration. Where the line would turn south and parallel the existing 500-kV transmission line, the separation would be 1,200 feet. BPA would acquire easement rights from the landowners for the land between the two lines, including the new ROW. See Appendix D, *Line Separation Issue Paper*, for an explanation of the separation distance.

Easement provisions would be the same as those discussed earlier for the Preferred Alternative.

2.5.3 Clearing

Clearing requirements would be the same as those discussed earlier for the Preferred Alternative. The structure footprints would be the same as described earlier for the single-circuit structures. The total permanent disturbance as a result of the 326 structures would be approximately 6.5 acres. Temporary disturbance from the equipment movement around the structures would be approximately 133.2 acres. If Option 2 of the Sickler-Schultz Reroute is selected, the structure count would increase by 2, permanent disturbance would increase by 0.05 acre and temporary disturbance would increase by 0.8 acre.

2.5.4 Access Roads

New access roads would be built for the majority of Alternative 1A. Roads would be built as described earlier in Alternative 1.

The following tables show the miles of estimated new access roads and existing roads that would need to be improved for each segment of Alternative 1A. Assumptions were made based on terrain and line location.

Table 2.5-1
Alternative 1A: Estimate of Access Road Development (Length)

Segment	Segment Length (mi)	New Construction (road mi/ segment mi)	Total New Construction (mi)	Improvement (road mi/ segment mi)	Total of Improved Roads (mi)
A	27.5	0.40	10.9	0.84	23.0
BSOUTH	9.5	0.35	3.3	1.47	14.0
F	32.8	0.89	29.2	1	32.8
TOTAL	**69.8**		**43.4**		**69.8**

Table has been updated for the FEIS.

Table 2.5-2
Alternative 1A: Estimate of Access Road Disturbance (Area)

Segment	Permanent Disturbance (Ac)	Temporary Disturbance (Ac)	Total Road Work Disturbance (Ac)
A	18.50	24.65	43.15
BSOUTH	5.65	12.60	18.25
F	19.55	45.10	57.15
TOTAL	**43.70**	**82.35**	**118.55**

Table has been updated for the FEIS.

2.5.5 Pulling and Reeling Areas

Pulling and reeling areas would be needed for the installation of the conductor. Each pulling and reeling area would be 1/4 acre in size and located every 3.5 miles. Alternative 1A would require an estimated 5 acres to be cleared for the pulling and reeling areas along the route.

2.5.6 Staging Areas

Staging areas would be located and used similar to those described earlier for the Preferred Alternative.

2.5.7 Substations

For Alternative 1A, a new transmission line would begin at the Schultz Substation and end at Hanford Substation. The line would pass through Vantage Substation.

Schultz Substation – The new equipment installed at Schultz Substation would be the same as described earlier for the Preferred Alternative.

Hanford Substation – The new equipment installed at the Hanford Substation would be the same as described earlier for Alternative 1.

Vantage Substation – The line would pass through the Vantage Substation in order to get from the west to east side of existing lines as described earlier for Alternative 1.

2.5.8 Communication Equipment

BPA would install fiber optic cable similar to what is described earlier for Alternative 1.

2.5.9 Maintenance

Maintenance activities would be similar to those described earlier for the Preferred Alternative.

2.6 No Action Alternative (Environmentally Preferred)

The No Action Alternative is traditionally defined as the no build alternative and, for this project, has been selected as the Environmentally Preferred Alternative. This alternative would mean that a new transmission line would not be built, and no other equipment would be added to the transmission system. Maintenance

and operation of the existing transmission line and substations would continue unchanged.

2.7 Alternatives Eliminated from Detailed Consideration

BPA studied a variety of alternatives to meet the need for the project. After preliminary study, the following alternatives were eliminated from detailed consideration for technical or economic reasons.

2.7.1 Alternative 4 Transmission Line

BPA studied the possibility of paralleling the existing Columbia-Ellensburg-Moxee-Midway 115-kV transmission line. The new line would begin at Schultz Substation and be routed through Ellensburg and Yakima, west of the YTC and into a new substation. This was referred to as Alternative 4 during the scoping period. BPA received a large number of comments from the public in opposition to this alternative. The existing 115-kV line is adjacent to many homes. Early estimates showed that the cost to buy property and relocate residents would be over $60,000,000. This did not include new transmission equipment, substation equipment, or construction costs. This alternative was eliminated from further study due to cost.

2.7.2 Schultz-Ashe Transmission Line

During the scoping process, maps presented by BPA showed a possible route going through the Hanford Substation and on to the BPA Ashe Substation located on the Hanford Site. Transmission system studies showed that line termination at the Ashe Substation, rather than the Hanford Substation, did not improve reliability. Termination of the line at the Ashe Substation also did not improve transfer capability over the Hanford Substation or Wautoma Substation alternatives. The 17 additional miles of transmission line needed for this alternative would increase the cost of construction by about $13,000,000.

This alternative was eliminated from further study because the system studies did not show an electrical benefit versus the added cost associated with the added miles of transmission line.

2.7.3 Undergrounding

During the scoping process, some people suggested burying the transmission line. Occasionally BPA has used underground transmission cables for new lines. Transmission line cables are highly complex in comparison to overhead transmission lines. For a 500-kV

line, the underground cable could be 10 to 15 times the cost of an overhead design.

Because of cost, BPA uses underground cable in limited situations. Underground cables are considered where an overhead route is not appropriate, such as water crossings, such as in the San Juans, or in urban areas.

Underground transmission cables used by BPA are short in comparison to typical overhead transmission lines. BPA's longest underground transmission cable (at 115-kV) is 8 miles. The Bureau of Reclamation operates two 500-kV underground cable circuits at Grand Coulee Dam. These circuits are about 6,000 feet long.

Cable technologies have not advanced as fast as the industry anticipated they would 10 years ago, nor have costs declined as expected. Underground cable remains a tool available for special situations, but because of its high cost it was eliminated from further consideration.

2.7.4 Non-Transmission Alternatives

During the comment period of the DEIS, comments were received asking BPA to examine alternatives such as energy conservation and demand reduction measures, or load and generation curtailment during outage conditions. These types of alternatives are collectively referred to as non-transmission alternatives. BPA had examined these types of alternatives, but had not included them in the DEIS.

To meet the need described in Chapter 1, BPA considered non-transmission alternatives, including energy conservation and demand reduction measures to reduce overload on the transmission system, as well as load and generation curtailment during outage conditions. Results of this study are in a report entitled "Expansion of BPA Transmission Planning Capabilities," which has been incorporated by reference in this EIS (Energy and Environmental Economics, Nov. 2001). This report was prepared for BPA by outside consultants to recommend how BPA might more effectively plan to meet transmission needs. The report also provided a preliminary screening of various transmission projects (including this project) to determine whether the use of non-transmission alternatives would be viable. The conclusions summarized below confirmed BPA's earlier assessment that non-transmission alternatives were not reasonable alternatives to meet the need as described in Chapter 1.

2.7.4.1 Conservation and Demand Management Alternatives

There are only small amounts of load north of the north of Hanford area. Conservation that reduces load to the north would only make the problem worse by increasing the amount of electricity that must cross the north of Hanford area. Other alternatives such as fuel switching (from electric to gas) or curtailing load would cause the problem to worsen because they reduce area load, thereby increasing the electricity that must flow across the constrained path. Distributed generation north of the north of Hanford area would also increase the congestion.

South of the north of Hanford area, conservation, generation additions, fuel switching, or curtailing load would not improve the problem unless existing generation north of the constrained area is shut down. Curtailing generation at hydroelectric projects at times could lead to spill conditions that would violate water quality standards for dissolved gases and could be harmful to fish.

2.7.4.2 Pricing Alternatives

Reminder

Words in bold and italics are found in Chapter 10, Glossary and Acronyms.

Currently, BPA, like all utilities in the Northwest, charges for transmission services using a fixed price for each megawatt of power delivered. The price is determined in a formal process known as a rate case. Alternatives such as ***locational pricing*** and ***time-of-use rates*** provide price signals to encourage parties to use limited transmission capability more efficiently. Most ***Regional Transmission Organizations (RTOs)*** essentially change the price of transmission when the grid becomes constrained, an approach called ***congestion pricing***.

BPA considered these alternative pricing structures in the rate case that determined the transmission rates currently in effect. Rate case participants argued that these pricing approaches were best developed in a region-wide RTO environment, and should be deferred until the ***proposed RTO West*** is operational. BPA's current transmission rates expire on September 30, 2003. BPA will assess the situation and examine alternative rate constructs in the next rate case.

Congestion pricing works to reduce congestion by allowing generation on the surplus side of the constraint (north side of north of Hanford) to shut down and purchase replacement power (or controllable demand) on the deficit (south) side. This approach is effective when there are competitive markets for generation or controllable demand on both sides of the transmission constraint.

There is significant hydro generation surplus to the north that cannot readily be redispatched during the spring and early summer months.

Reduced hydro generation could result in water being spilled. Spilling water at these dams could violate state water quality standards and harm fish.

Hydro resources south of the Hanford area, on the lower Columbia, are often run at minimum levels during parts of the spring/summer. The water in the river is spilled over the dams to help move young fish down the river and out to the ocean. Also, coal and natural gas resources south of the Hanford area are likely to be running at high levels to participate in the California market. Generation would not be available to displace what is not generated north of the Hanford area. This project is not a good candidate for congestion pricing.

2.8 Comparison of Alternatives and Summary of Impacts

A team of environmental specialists evaluated the impacts associated with each of the alternatives. Each resource specialist developed an impact assessment methodology that determined the level, magnitude, and significance of their impact findings, which are described in Chapter 4, *Environmental Consequences*. Table 2.8-1, *Summary of Impacts*, summarizes the environmental impacts for each alternative.

Chapter 1, *Purpose and Need*, identifies the purposes for this project. Purposes help decision-makers decide which alternative is the best solution to meet the need. Table 2.8-2, *Comparison of Alternatives to Project Purposes*, describes how each alternative fulfills the purposes.

For Your Information

Impacts to resources along route options B_{NORTH} and B_{SOUTH} ranged from none to moderate. For all resources studied, there were no significant differences in impacts between B_{NORTH} and B_{SOUTH}.

Impacts to resources along the Segment A Reroute are discussed in Appendix B, Description and Comparison of Impacts Along Segment A Reroute. A comparison between the Segment A reroute and the corresponding portion of Segment A is also included.

Table 2.8-1
Summary of Impacts

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Water Resources (See Sections 3.1, *Water Resources*, and 4.1, *Water Resources, Soils, and Geology*.)	Watersheds within the project area are a part of the Yakima and Columbia River Basins. With the exception of the Columbia River, water is scarce. Streams are generally small and intermittent. Lower Crab Creek and the Columbia River are listed as water-quality limited under Section 303(d) of the Federal Clean Water Act, due to extensive habitat modification. In addition, the project area is within the Columbia Plateau basaltic aquifer system. Groundwater quality issues are mostly due to elevated concentrations of nutrients, trace organic compounds and nitrates.	Impacts would be low to moderate and short term. Sedimentation, increased runoff, and short-term turbidity would occur. It is not anticipated that impacts to streams listed as water-quality limited under Section 303(d) would alter the parameters for which they are listed. Impacts to aquifers are not anticipated.	Impacts would be low to moderate and short term. Similar to the Preferred Alternative.	Impacts would be moderate and short term. This alternative has the largest number of acres of new access roads. This would cause sedimentation, increased runoff, and short-term turbidity to water resources. No Section 303(d) stream would be crossed. Impacts to aquifers are not anticipated.	Impacts would be low to moderate and short term. Similar to the Preferred Alternative.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Floodplains (See Sections 3.2, *Floodplains and Wetlands,* and 4.2, *Floodplains and Wetlands.*)	All proposed alternatives would cross 100-year floodplain areas. The floodplain associated with the Columbia River is narrow, due to the regulation of flows by upstream dams. One floodplain is associated with Nunnally Lake, a narrow water body. The remainder of the floodplains in the project area are narrow and associated with creeks, including Wilson, Naneum, Caribou, Crab, and Dry Creeks. Impacts to floodplains could occur from the placement of structures.	Impact to floodplains would be low to moderate. Two floodplains would be impacted. One structure and an access road would be constructed in the 100-year floodplain of Naneum/Wilson Creek slightly decreasing the amount of flood storage, which would be a low level of impact. A new access road with two 9-foot arch culverts would cross the Dry Creek 100-year floodplain, altering the course of floodwaters and decreasing the amount of flood storage, which would be a high level of impact. The new substation would be located outside of the floodplain.	Impacts to floodplains would be low. Two floodplains would be impacted. One structure and an access road would be constructed in the 100-year floodplain of Naneum/Wilson Creek slightly decreasing the amount of flood storage, which would be a low level of impact.	Impact to wetlands would be low to moderate. Two floodplains would be impacted. One structure and an access road would be constructed in the 100-year floodplain of Naneum/Wilson Creek slightly decreasing the amount of flood storage, which would be a low level of impact. A new access road with two 9-foot arch culverts would cross the Dry Creek 100-year floodplain, altering the course of floodwaters and decreasing the amount of flood storage, which would be a high level of impact. The new substation would be located outside of the floodplain.	Impact would be the same as Alternative 1.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Wetlands (See Sections 3.2, *Floodplains and Wetlands,* and 4.2, *Floodplains and Wetlands.*)	Wetlands are uncommon within the shrub-steppe areas of eastern Washington. Wetlands found in the area are typically supported by water sources such as creeks, springs, seeps and surface runoff.	Impacts to wetlands would be moderate. Seven wetlands were identified along the preferred alternative. Four of these wetlands would have moderate impacts from new access road or tower construction and access road improvements. Three wetlands would have no impacts. Associated wetland at Cooke Creeks would have 25-30 cottonwoods removed. Maintenance activities such as improving access roads could impact wetlands.	Impacts to wetlands would be moderate, similar to the Preferred Alternative, with 12 creek crossings and possible removal of trees in three riparian areas.	Impacts to wetlands would be moderate, similar to the Preferred Alternative, with 18 creek crossings and possible removal of trees in two riparian areas.	Impacts to wetlands would be moderate, similar to the Preferred Alternative, with 11 creek crossings and possible removal of trees in four riparian areas.	No new impacts are expected.
Soils & Geology (See Sections 3.3, *Soils and Geology*, and 4.1, *Water Resources, Soils, and Geology.*)	There are diverse landforms and geologic features within the Columbia Plateau. The plateau's landscape consists mostly of large and small hills with flat tops, extensive plateaus, incised rivers, and anticline ridges. Geologic hazards include steep slopes and erosion. Blowing soil and water erosion are the most active erosion processes, due to the area's high relief, steepness of slope, and restricted available water.	Low to moderate impact is anticipated, caused by erosion, the loss of productive soils, and increased runoff.	Low to moderate impacts are anticipated similar to the Preferred Alternative.	Moderate impacts would occur caused by erosion, loss of productive soils, and increased runoff.	Low to moderate impacts are anticipated similar to the Preferred Alternative.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Vegetation (See Sections 3.4, *Vegetation*, and 4.3, *Vegetation*.)	The vegetation in most of the project area is shrub-steppe. With the exception of some riparian areas, few trees are found. Sagebrush species are the dominant woody vegetation. Two Washington Natural Heritage Program (WNHP) high-quality plant communities occur in the project area: the Wyoming big sagebrush/ bluebunch wheatgrass shrubland (Segment A), and the bitterbrush/ Indian ricegrass shrubland (Segments D, E, and F).	There are potential temporary impacts to 161.45 acres of shrub-steppe areas and potential permanent impacts to 44.40 acres of shrub-steppe. In Segment A, there are potential temporary impacts to 2.10 acres of forested and riparian areas and 0.10 acres permanent impacts. Disturbance to these shrub-steppe and riparian areas represents a moderate to high impact. In Segment D, 2.10 acres of temporary impacts and 0.25 acres of permanent impacts to a WNHP high quality plant community would be caused by construction, which would be a moderate impact. The introduction or spread of weed species would be a high impact.	There are potential temporary impacts to 174.10 acres of shrub-steppe areas and potential permanent impacts to 39.50 acres of shrub-steppe. There are potential temporary impacts to 2.95 acres of forested and riparian areas and 0.10 acres permanent impacts. Disturbance to these shrub-steppe and riparian areas represents a moderate to high impact. There are potential impacts to 2.8 miles of a WNHP high-quality plant community in Segment E. This represents a moderate to high impact. The introduction or spread of weed species would be a high impact, depending on the quality of the plant communities affected.	There are potential temporary impacts to 251.20 acres of shrub-steppe areas and potential permanent impacts to 175.65 acres of shrub-steppe. There are potential temporary impacts to 3.25 acres of forested and riparian areas and 0.10 acres permanent impacts. Disturbance to these shrub-steppe and riparian areas represents a moderate to high impact. The construction of a new transmission line in an area currently without one is expected to degrade existing plant communities. This could result in a low to high impact, depending on the quality of the plant communities impacted. The introduction or spread of weed species would be a high impact, depending on the quality of the plant communities affected.	There are potential temporary impacts to 215.25 acres of shrub-steppe areas and potential permanent impacts to 79.00 acres of shrub-steppe. In Segment A, there are potential temporary impacts to 2.10 acres of forested and riparian areas and 0.10 acres permanent impacts. Disturbance to these shrub-steppe and riparian areas represents a moderate to high impact. The construction of a new transmission line in an area currently without one is expected to degrade existing plant communities. This could result in a low to high impact, depending on the quality of the plant communities impacted. There are potential impacts to 0.3 miles of WNHP high-quality plant community in Segment F. This represents a moderate to high impact. The introduction or spread of weed species would be a high impact depending on the quality of the plant communities affected.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Threatened & Endangered, and Sensitive Vegetation (See Sections 3.4, *Vegetation*, and 4.3, *Vegetation*.)	Potential habitat for rare and endangered plant species is scattered throughout the study area. A survey of the preferred alternative identified populations of these species.	Impacts would be moderate to high if species are not avoided. Along Segment D, there is known habitat for Umtanum wild buckwheat (federal candidate) just off the ROW. This area would be avoided. Tufted evening primrose, Piper's daisy and desert cryptantha (State sensitive species) would be impacted on part of Segment $B_{SOUTH,}$ and D, a moderate impact. Columbia milk-vetch, gray cryptantha and Hoover's desert parsley could be impacted on Segment D, a moderate impact.	Impacts would be moderate to high if species are not avoided. Tufted evening primrose, and desert cryptantha (State sensitive species) would be impacted on part of Segment $B_{SOUTH,}$ a moderate impact..	Impacts would be moderate to high if species are not avoided. Columbia milk-vetch (federal species of concern is located in the alignment of Segment C. and could be impacted, a moderate impact.	Impacts would be moderate to high if species are not avoided. Tufted evening primrose and desert cryptantha (State sensitive species) would be impacted on part of Segment $B_{SOUTH,}$, a moderate impact. Along Segment F, Hoover's desert parsley (federal species of concern), dwarf evening primrose (state threatened), and Texosporium sancti - jacobi (federal species of concern) are present and could be impacted, a moderate impact	No new impacts would occur.
Wildlife (See Sections 3.5, *Wildlife*, and 4.4, *Wildlife*.)	The shrub-steppe habitat in the study area supports a variety of wildlife species including birds, mammals, reptiles, and amphibians. The study area is located within the Pacific Flyway. Crab Creek (Segments D, E, and F) is an important wildlife migratory corridor, and one of the most important flyways in Washington for migrating birds.	Impacts would be high to low. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Existing habitat along Segment D is variably degraded.	Impacts would be high to moderate. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Segment E is mostly disturbed agricultural area with low habitat value, except for the Hanford Site, which is high quality, important undisturbed shrub-steppe habitat.	Impacts would be high. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Existing habitat in Segment C is relatively undisturbed, especially in the YTC.	Impacts would be high. Parts of Segment A are relatively undisturbed shrub-steppe habitat. Segment F along Saddle Mountains is high elevation, sensitive habitat that is relatively undisturbed. The Hanford Site is high quality, important undisturbed shrub-steppe habitat.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Threatened & Endangered Wildlife (See Sections 3.5, *Wildlife*, and 4.4, *Wildlife*.)	The south side of Umtanum Ridge (Segment C) is a core area for sage grouse. Wintering and breeding bald eagles occur in the project area.	With mitigation, impacts would be low to bald eagles that winter along Wilson and Naneum Creeks on Segment A. Impacts to sage grouse along Segment A and B would be low to moderate. Segment D has few T&E species occurrences.	With mitigation, impacts would be low to bald eagles that winter along Wilson and Naneum Creeks on Segment A and in the Hanford Reach National Monument on Segment E Impacts to sage grouse along Segment A and B would be low to moderate.	With mitigation, impacts would be low to bald eagles that winter along Wilson and Naneum Creeks on Segment A and in the Hanford Reach National Monument on Segment E Impacts to sage grouse along Segment A would be low to moderate and along Segment C would be high.	With mitigation, impacts would be low to bald eagles that winter along Wilson and Naneum Creeks on Segment A and in the Hanford Reach National Monument on Segment F Impacts to sage grouse along Segment A and B would be low to moderate.	No new impacts would occur.
Fish Resources (See Sections 3.6, *Fish Resources*, and 4.5, *Fish Resources*.)	Several streams that the project would cross provide habitat for over 16 species of fish. In addition, the Columbia River hosts approximately 40 species of fish. chinook salmon, sockeye salmon, steelhead, and Pacific lamprey use the Columbia River in the study area as a migration corridor. Fish commonly pursued for sport include whitefish, small-mouth bass, sturgeon, catfish, walleye, and perch. Rough fish such as squawfish, carp, suckers, and shiners are also present in large numbers.	Impacts would be low to none. Ten fish-bearing streams would be crossed.	Impacts would be low to none. Eleven fish-bearing streams would be crossed.	Impacts would be moderate to low. Seventeen fish-bearing streams would be crossed.	Impacts would be low to none. Eleven fish-bearing streams would be crossed.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Land Use (See Sections 3.7, *Land Use*, and 4.6, *Land Use*.)	The alternatives cross private and public land in five Washington counties. Land use varies by line segment, but mostly include rangelands and some agricultural lands, military lands and lands designated for preservation, and limited residential lands.	The overall land use impact would be moderate. There would be a moderate to high impact on residential and quarry land uses, which are localized. The impact to the YTC would be moderate/ low. Impacts to the Hanford Reach National Monument would be high. Impacts to other public lands would be low to moderate. Agricultural impacts would be moderate along Segment D, where about 8 miles would be double-circuited, but high in other places.	Overall impact to land use would be high. Impacts to the YTC and quarry land use are similar to the Preferred Alternative. About 4.8 miles of agricultural lands on both public and private land would be affected, a high impact. Impacts to residential uses along portions of Segment E would be low, but high along Segment A. Impact to BLM lands would be low. The land crossed on the Hanford Reach National Monument and the Hanford Site has a Preservation land use designation. Since this alternative would require new ROW, the impact to preservation efforts would be high.	Impacts to land use would be high. The majority of land crossed is on the YTC. The new transmission line would eliminate the Department of Defense's ability to perform the training, aviation, and ground maneuvers that currently occur, which would be a high impact. The remaining land crossed is both public and private rangeland. Impacts to rangeland would be low. There would be a moderate to high impact on residential and quarry land uses, which is localized.	Impacts to land use would be moderate. Impacts to the YTC, residential, and quarry land uses are similar to the Preferred Alternative. Segment F would require new ROW, with 39.2% of the line crossing land administered by BLM for multiple land uses. Impact to the BLM lands would be low. The land crossed on Hanford Reach National Monument and the Hanford Site has a Preservation land use designation. Since this alternative would require new ROW, the impact to preservation efforts would be high.	No new impacts would occur.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Socioeconomics (See Sections 3.8, *Socioeconomics*, and 4.7, *Socioeconomics*.)	The rural character of central Washington is linked to the local socioeconomics. Agriculture is an important industry sector that influences local economies and demographic composition. Other industries important to the area include service, retail trade, and manufacturing sectors. In general, Kittitas, Grant, Yakima, and Benton counties are less racially diverse, have lower per capita and median household incomes, and have a lower percentage of income derived from work earnings than Washington state as a whole.	No impacts to local populations are expected to occur. Two residences would be relocated, which would be a negative impact. A positive impact to local and state tax revenues and local economies would result from construction-related jobs and expenditures. A small negative impact in property tax revenues would occur from BPA's purchase of land to locate the new substation.	No impacts to local populations are expected to occur. One residence would be relocated, which would be a negative impact. A positive impact to local and state tax revenues and local economies would result from construction-related jobs and expenditures.	Impacts would be similar to the Preferred Alternative. However, only one residence would be relocated.	Impacts would be similar to Alternative 1.	The No Action Alternative would not directly or indirectly impact the local population, economy, or tax base. However, this alternative would have other socio-economic impacts to the local area and greater region, as a result of the lack of adequate transmission line infrastructure to support expected growth in the Pacific Northwest.
Visual Resources (See Sections 3.9, *Visual Resources*, and 4.8, *Visual Resources*.)	The area's visual character and quality are primarily natural and rural. It is defined by rolling mountains, steep and dramatic mountain ranges, consistent stretches of scrub-steppe vegetation, and agricultural uses such as orchards, vineyards, and crop circles.	Visual impacts would be low to moderate. Segment A in the Colockum Pass area would pass close to a number of residences. The proposed structures would not dominate the view. The route through Segments D would be clearly visible to residents, tourists, and recreationalists in the Saddle Mountain area. B_{SOUTH} would parallel the John Wayne Trail and be visible to users of this recreational feature.	Visual impacts would be low to moderate. Impacts would be similar to the Preferred Alternative, except Segment E's location in the Saddle Mountain area is slightly further from most viewers than the Segment D alignment.	Visual impacts would be low to moderate. Impacts to the Colockum Pass area would be similar to the Preferred Alternative.	Visual impacts would be low to moderate. Impacts would be similar to the Preferred Alternative, except Segment F would cross the north face of the Saddle Mountains furthest from most viewers, and has a sensitive siting relationship with the Saddle Mountain Ridge.	No new impacts are expected.

Resource	Existing Conditions	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action
Recreation Resources (See Sections 3.10, *Recreational Resources*, and 4.9, *Recreational Resources*.)	Recreational activities in the area are dispersed.	Impacts to recreational resources would be low. No long-term effects to recreational resources are expected. All impacts would be temporary and related to construction.	Impacts would be low and similar to the Preferred Alternative.	Impacts would be low and similar to the Preferred Alternative.	Impacts would be low and similar to the Preferred Alternative.	No new impacts are expected.
Cultural Resources and Historic Properties (See Sections 3.11, *Cultural Resources and Historic Properties*, and 4.10, *Cultural Resources and Historic Properties*.)	Cultural resources and historic properties located within close proximity of the project's Area of Potential Effect (APE) include prehistoric camps and villages, prehistoric burial grounds, prehistoric caves, archaeological districts, lithic scatters, prehistoric stone tool quarries, historic homesteads, historic railroad sites, historic refuse scatters, traditional fishing locations, and traditional root-gathering areas.	Thirty-six recorded sensitive areas were identified in the Draft EIS literature review. Survey results identified 104 cultural resources within the APE; 66 are historic properties that are eligible or potentially eligible for listing on the National Register of Historic Places (NRHP). All known historic properties would be avoided.	Thirty-eight recorded sensitive areas were identified in the Draft EIS literature review. All sites important, no levels given.	Thirty-eight recorded sensitive areas were identified in the Draft EIS literature review. All sites important, no levels given.	Forty recorded sensitive areas were identified in the Draft EIS literature review. All sites important, no levels given.	No new impacts would occur.
Public Health & Safety (See Sections 3.12, *Public Health and Safety*, and 4.11, *Public Health and Safety*.)	Electric and magnetic fields are found around existing transmission lines. Corona-generated audible noise is present near existing transmission lines in the area. Hazardous and toxic materials are found in substation equipment and are used in maintenance activities.	Health and safety impacts would be low to moderate. Noise impacts would be low.	Impact would be similar to the Preferred Alternative.	Health and safety impacts would be low. Noise impacts would be low.	Impacts would be similar to Alternative 3.	No new impacts would occur.
Air Quality (See Sections 3.13, *Air Quality*, and 4.12, *Air Quality*.)	Air quality in the area is generally good. Wind-blown dust is the leading cause of diminished air quality.	Dust during construction activities would have a temporary low impact. There would be no long-term air quality impacts from this alternative.	Similar to Preferred Alternative.	Similar to Preferred Alternative.	Similar to Preferred Alternative.	No new impacts would occur.

Table 2.8-2
Comparison of Alternatives to Project Purposes

Purposes	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action Alternative
Maintain transmission system reliability	• Would provide another line north of the Hanford Substation. • Would connect two existing 500-kV lines and the new line to Wautoma Substation to reduce system impacts resulting from the potential loss of two existing lines south of the Hanford Substation. • Would create a new switching station for the 500-kV transmission grid.	• Would provide another line north of the Hanford Substation.	• Would provide another line north of the Hanford Substation. • Would connect the existing 500-kV lines and the new line to Wautoma Substation to reduce system impacts resulting from the potential loss of two existing lines south of the Hanford Substation. • Would create a new switching station for the 500-kV transmission grid. • BPA has concerns for the safety of a line built near the use of live ammunition.	• Would provide another line north of the Hanford Substation. • May increase the risk of losing the existing and new line north of the Hanford Substation.	• Transmission system would remain at the existing level of capacity and reliability.
Optimize System Usage	• Would reduce loading of existing transmission lines west of the Cascades by 170 MW. • Would facilitate the integration of new generation.	• Would reduce loading of existing transmission lines west of the Cascades by 140 MW. • Would facilitate the integration of new generation.	• Would reduce loading of existing transmission lines west of the Cascades by 170 MW. • Would facilitate the integration of new generation.	• Would reduce loading of existing transmission lines west of the Cascades by 140 MW. • Would facilitate the integration of new generation.	• Would not off-load the existing transmission lines west of the Cascades. • Would not facilitate the integration of new generation.
Minimize environmental impacts *(See Table 2.8-1, Summary of Impacts)*	• Would create the least environmental impacts of all alternatives. Segment D essentially expands existing ROW, reducing impacts to areas presently unaffected by transmission lines. Cumulative impacts would be less than constructing new roads in undisturbed areas.	• Would create more environmental impacts than the Preferred Alternative. Segment E would cause impacts by establishing a new ROW in the vicinity of, but not directly adjacent to, an existing ROW.	• Would create a similar level of environmental impacts as Alternative 1A. Segment C would be a new ROW through the YTC, causing impacts to plants and wildlife through the disturbance of the shrub-steppe ecosystem.	• Would create a similar level of environmental impacts as Alternative 3. Segment F would be a new ROW along the Saddle Mountains causing impacts to plants and wildlife through the disturbance shrub-steppe lands.	• Would not cause any construction-related environmental impacts. • This is the Environmentally Preferred Alternative.

Purposes	Preferred (2)	Alternative 1	Alternative 3	Alternative 1A	No Action Alternative
Minimize costs	Estimated cost of $107,000,000.	Estimated cost of $124,000,000. The increased cost would result from land costs to purchase of easements across farmland between Vantage and Hanford Substations.	Estimated cost of $94,000,000. This cost does not reflect all costs potentially associated with this alternative. No land costs were added to the estimate for the purchase of easements across the YTC. It is possible BPA would need to compensate the Army for the loss of the use of land used for maneuvers.	Estimated cost of $94,000,000. Segment F avoids much of the agricultural areas and thus reduces land costs.	No costs associated with this alternative.
Provide earliest energization date	Would meet the scheduled energization date of late 2004.	Would be difficult to meet the energization date. Acquiring easements across irrigated agricultural land could potentially delay the schedule. In addition, obtaining easements through Hanford Reach National Monument could also delay the schedule.	Would likely not meet the energization date due to Army reluctance to allow a new ROW to cross the military reservation. This land is also of high concern to the tribes.	Would be difficult to meet energization date. Obtaining easements through Hanford Reach National Monument could potentially delay the schedule.	Not applicable.